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ABSTRACT

Although adolescence is generally recognized as a period of dramatic change, the issue of whether it is also a time of stress and disturbance is still controversial. To examine the impact of pubertal development on adolescents, data were used from a 5-year longitudinal study of white males and females. A variety of self-concept, behavioral, value, and attitudinal measures indicated that for a substantial number of those dimensions, pubertal development had no effect. Early physical development was a mixed blessing for girls in terms of opposite sex popularity and greater independence but a disadvantage in terms of dissatisfaction with their body image, lower academic success, and problem behavior. For males, early development was more of an advantage linked to higher self-esteem and a more stable self-image. The findings are generally consistent with the results from other research. (JAC)

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A Longitudinal Study*

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The Impact of Puberty on Adolescents: A Longitudinal Study

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Adolescence is generally recognized as a period of dramatic, physical, emotional, and social changes. However, whether it is also a time of stress and disturbance is an issue of controversy (Douvan and Adelson, 1966; Douvan and Gold, 1966; Bealer et al., 1969; Offer, 1969; Bandura; 1972). Furthermore, it is unclear what the contribution of the physical changes of puberty are in exacerbating or alleviating whatever stress occurs at this age (see Eichorn, 1963; Clausen, 1975). After a brief discussion on how puberty might impact a variety of characteristics and a delineation of what general effects puberty might have, we shall note some general findings from the literature and then focus on the impact of pubertal development on a wide variety of social and psychological reactions of both male and female adolescents. In particular we shall look at the effects of pubertal change on male and female self-concepts and on many of their behaviors, values, and attitudes.

Before discussing what the effects of puberty might be or have been shown to be, it is important to think about how puberty might affect social and psychological development. Clausen (1975), for example, discussed three ways in which physical development may influence the social and psychological development of adolescents. He notes first, that relative maturity, size, and type of physique

can directly affect the individuals actual performance capabilities. That is, the developing adolescent may actually be stronger and more coordinated than his relatively undeveloped peer. Second, he notes that physical maturation influences the way in which one is seen by others and the expectations which they hold. Thus, not only is the child himself changing competencies but how that child is viewed by his significant others may also be changing in important ways. Finally, the adolescent himself or herself may be reacting to physiological changes and the changing perceptions of him or herself. Both the actual competencies of the individual and his or her perceptions of themselves can be further influenced by actual physiological or hormonal changes which are taking place within them.

All of these mechanisims or processes can effect an individual and are extremely complex and difficult to specify. This difficulty is further enhanced when one considers the complexity of what we mean by phsycial development itself. A wide variety of both primary and secondary changes are occurring during puberty. The interrelationship of these changes and the importance of some particular changes for certain social and psychological consequences is difficult to specify. For example, in addition to the increase in weight and height in adolescence there are alterations in the distribution of fat, an increase of strength, development of secondary sexual characteristics, and changes in body proportions such as shoulder and hip width and leg length. As if this complexity is not enough there is also the issue of differential rates of changes and the asynchrony of these changes

to be coped with. Given this variety, it is not surprising that we know relatively little about the effects of particular aspects of physical development on specific aspects of social and psychological development during the early and middle adolescent time period.

In spite of this complexity, there are basically three conceptualizations of what the impact of pubertal development will be on the social and psychological development of males and females. The first conceptualization argues that pubertal change will have negative consequences primarily because change itself is viewed as inheritally stressful. In this view, the internal endocrine changes as well as dramatic alterations in physical appearances are seen as major stressors particularly for girls (see Petersen and Taylor, 1980). According to this reasoning, the negative impact of pubertal changes should be relatively immediate and short lived diminishing as the girl adjusts to her new physiology and self-image. In this view, the period of physiological disturbance should start and end earlier for early developing girls than for late developing girls but both will exhibit signs of distress close to the time of maximum physiological change.

A second conceptulization argues that pubertal changes will have positive consequences for the individual. This conceptualization argues that if change occurs in such a way that the adolescent looks more like an adult and hence will be more likely to be granted adult status, the change will be advantageous (see for example Faust, 1960). The argument here boils down to the

fact that the adolescent is changing into a more desired and higher prestige status and therefore ought to accrue some benefits as a result of this change. Once again the relative benefits will be short lived since soon all adolescents will be adult like. This conceptulization argues that the benefits will accrue primarily to the early developers who will be the first among their peers to reach adult status. Once the late developers reach maturity it will be impossible to use this dimension to distinguish between adolescents.

The final conceptulization concerns itself primarily with the timing of development as the critical factor. This conceptulization argues that pubertal development in and of itself, cannot be labeled as either positive or negative. Within this conceptulization there are two distinct lines of thought. First, there are those who argue that puberty will have the greatest impact on two deviant groups: those who are early developers and changing when few others are doing so, and those who are late developers and lag behind the rest of their peer group. The basic reasoning here is that being part of a minority and deviant in relationship to one's peers is stressful. See Gold and Tomlin, 1975 or Petersen and Taylor, 1980. According to this view early developers will exhibit negative effects during and just after pubertal change. Similarily, the late developers will demonstrate negative reactions before they change (that is when they are in the minority). Thus the prediction of this conceptulization for late developers is different than the first one noted in that it expects the negative reactions to occur prior to the time of major

physical changes rather than during the time of physical change itself.

The second line of thought with regard to timing stems from the psycho-dynamic model. According to this approach, not having enough time in a life stage will have negative consequences that will extend into the next life stage. This view is particularly well developed in Peskin and Livson, 1972. From this perspective early developing individuals will have difficulty during adolescence in so far as they have a shortened latency period. It is argued that if the latency period and the related gains in ego development is prematurely cut short, then the individual will experience adolescence as a time of difficulty. On the other hand, late developers will be limiting the period of time they have in adolescence and thereby not allowing enough time to adjust to their new selves prior to reaching adulthood. Thus the later developer should show more difficulty during adulthood.

While these alternate conceptulizations are useful, they should not be viewed as mutually exclusive. That is, during adolescence there are a variety of social and psychological developments occuring and which of these conceptulizations apply to the different aspects of development is an issue to be explored. During the teen years it is possible that pubertal development affects various dependent variables differently, and that both negative and positive consequences can be found.

Most of the literature to date has been derived from several

California longitudinal research studies. These and other studies have already provided some evidence on the impact of pubertal changes for both males and females. For example, these studies have shown that girls who reach puberty earlier than most of their peers initially show more negative reactions to their bodies, have less popularity with their same sex peers, have lower degrees of sociability, are less likely to be leaders and have generally lower levels of happiness. Sexually developing girls are described as bigger than most of their male and female classmates and as feeling unattractive as a result. In addition, early developing girls have demonstrated more interest in the opposite sex. There is also some evidence that once pubertal changes are far behind and early developing girls move into adulthood they actually attain higher levels of well being than do other girls.

Early maturing boys, on the other hand, have generally been found to be more poised, relaxed, socially advanced and more respected in their peer group. The later maturing boys have been found to be expressive, dynamic, and buoyant but also tenser and more concerned with their physical appearance.

These findings suggest, as others have noted, that early physical development is more likely to be an advantage for males than it is for females. The findings for girls suggest that early development may in fact be a disadvantage in several respects. One reason for these differential consequences as a function of sex is that there are different cultural stereotypes or sex roles operating. Thus, for males physical development means they are

becoming stronger and bigger and more closely approximating the male ideal. For females however, increasing physical development when few others are so developed may cause an intensification of gender related role expectations which they are unable to deal with and which are different than the way in which they have been treated in the past. This intensification or change in sex roles may partially account for some of the negative consequences reported. None of the studies cited above, however, have attempted to look at how a broad array of social and psychological variables are affected by pubertal development during both early and middle adolescence.

The present study shall explore the impacts of pubertal development in males and females across just such a wide array of self-concept, behavioral, value and attitude dimensions. It shall do this throughout the early and middle adolescent time period in order to focus on three primary questions. First, what is the direction of the effect of puberty, especially early versus late puberty? Is early pubertal development an advantage or a disadvantage during early and middle adolescence? Second, are the effects of puberty relatively short term and temporary or do they persist into middle adolescence? Finally, is there any evidence that the early maturing individuals are either acting more like adults or being treated more like adults by significant others? In examining these questions we shall look at both the overall effect of pubertal development as well as the effect of such development after controlling for differences in individual heights and weights. In this manner we will be able to separate

out some of the effects of puberty which are merely correlates of the individuals height and weight rather than an effect of pubertal change itself.

METHODS

The data for the present analysis is taken from a five year longitudinal study which was designed to explore the impact of puberty and differences in school settings on a wide variety of social and psychological variables. The study was conducted within the Milwaukee Public Schools from 1974 to 1979. A stratified random sample of schools was drawn from two types of schools which existed in Milwaukee at that time: the kindergarten through eighth grade elementary school and the kindergarten through sixth grade elementary school which fed into a seventh through ninth grade junior high school. A total of eighteen schools were randomly selected and all sixth grade students from these schools were invited to participate. Parental permission was secured for 82% of these for a total of 924 sixth graders in the first year of the study. These same students were then followed as they went into seventh, eighth, ninth and tenth grade over a five year period. Only those students who remained in the Milwaukee Public Schools were interviewed each year. Approximately 60% of the original sixth grade sample was interviewed in the final year of the study (tenth grade). For white children in general there was greater sample loss in cases of broken families and among the highest socioeconomic group. Since the children are too young to leave school legally and since

we attempted to interview those who were frequently absent outside the school setting, much of the sample loss reflects the family's moving (as is more likely to occur in broken families) or the family's removal of the child from the city public schools and their use of suburban, private, or parochial schools instead (as is more likely in the highest SES strata). In fact, the primary source of sample mortality was the students leaving the Milwaukee school system rather than subsequent refusal to participate in the study. It should also be noted that more early developing students (particularly girls) left the sample than was the case for middle or late developing students. While this presents some problems for interpretation, it may also be a significant finding in and of itself. Further work in determining the exact reason early developing students left our sample is currently being conducted.

The data used for this analysis represent the total number of white students available in each year in our sample. This way we approximate the original random sample as closely as possible. This strategy provides more confidence in the generalizability of the results to the public school population from which we drew the sample. The data are most generalizable in sixth grade before any dropouts occur. In subsequent years, we cannot generalize to children who left the Milwaukee school system, but only to those who remain. In order to make certain the differences in results between early and late years are not simply due to the fact that some children have dropped out of the study, we have run all analyses reported here for that subsample of children present for

interviews in all four years (grades sixth, seventh, ninth and tenth). The results generally indicate that there are few differences of substance. In most cases it can safely be assumed that the results are the same whether one uses the full sample each year or only the complete longitudinal sample. The actual number of students used at each grade level in the present analysis is noted in Table 1.

Measurement

The primary data from this study comes from personal, structured interviews conducted privately with each student for approximately one hour in grades sixth, seventh, ninth and tenth. Interviews were conducted by trained survey interviewers within the confines of the school the student attended. In addition, a private registered nurse interviewed and measured each student to help establish the level of the child's physical development. These physical measures were obtained in the fall and spring of sixth and seventh grade and in the spring of eighth, ninth, and tenth grades. In each grade at least one set of physical measurements were collected as close as possible to the day of the survey interview. Finally, a variety of secondary data including achievement test scores and grade point averages were also obtained from school records.

Female Pubertal Development-- In order to better understand the relationships to be explored two different but related

measurements of pubertal development were constructed for females. The first refers to the presence versus absence of menstruation at the time of any one survey interview. On each occasion at which the girl was interviewed by a nurse (seven times in total) she was asked:

> Have you ever had a menstrual period or monthly bleeding, or haven't you had a period yet?

If the response was affirmative she was then asked to report the month and year of her first period and her age at the time of onset. After examining all five years of available information about the time of onset a decision was made as to the best estimate of when first menarche occurred. That date of onset was then used to establish whether or not the girl was menarchial at the time of our interviews.

The second aspect of puberty we shall refer to as the "relative onset of menarche" or as "early/middle/late development". This is a longitudinal measure derived from the same questions noted above. Girls were categorized as early, middle, or late developers based on when they reported having their first period. This trichotomy was designed to split the distribution into equal thirds, but to still relate the time of onset of menses to natural school year breaks. The resulting split is not a perfect tricotomy, but it is as close as possible. Those girls who reached menarche prior to the beginning of seventh grade were classified as early developers. Thirty eight percent of the girls in the sample are in this category. Girls labeled as middle developers reached menarche during seventh grade or the following

summer. Twenty seven percent of the girls in our sample fall in this category. Finally, girls who had not reached menarche prior to the beginning of eighth grade were considered to be late developers (35%). By the spring of ninth grade only seven girls had not reached menarche. All but one of these was pubertal by the spring of tenth grade.

These two variables--"presence versus absence of menstruation" and "relative onset of menses"--are slightly different ways of looking at pubertal development. Knowing whether a girl is an early, middle, or late developer in relation to her peers (relative onset") does not indicate whether the significant event of menarche ("presence of menstruation") had occured at the time of the interview. This is particularly true in sixth and seventh grade, since a random half of the sample was interviewed in the fall and the other random half in the spring. Alternately, classifying a girl as to presence or absence of menstruation at the time of a particular interview often does not in itself establish whether she is an early, middle or late developer. For example, if we find a girl has begun menstruating by the seventh grade interview we still do not know whether she is an early or middle developer since members of both groups are likely to obtain menarche by this interview. If she has not begun menstruating, we can not tell with this information alone whether she will become a middle or late developer. Thus, while the two variables (presence of menstruation and relative onset) are significantly correlated, they are not identical. Nonetheless, both early developers and the girls who have begun menstruation at the time of the interview

at issue are more advanced in pubertal development than their respective counterparts. Thus we expect the two variables to relate in the same direction with regard to most dependent variables although it is possible that they might not do so. For example, regardless of whether she is an early, middle, or late developer, it is plausible that following menarche a girl's feminine self-image may take a sharp jump, either because of her attitude toward the symbol of menstruation or because of a change in her endrocine levels.

While it is possible to compare early, middle, and late developers across all four years, contrasting those who have begun menstruating is meaningful only in sixth and seventh grade. In later years there are simply not enough girls without menstrual periods to make valid comparisons.

Male Pubertal Development Although there is no directly analogous indicator of pubertal development for boys which is either as dramatic or reliable as menarche is for girls, we decided to use an indicator of male development which was also a relatively late aspect of pubertal development. For males we selected the period of time in which the boy experiences the highest or peak rate of height growth during our study. This measure is derived from Stolz and Stolz (1944) and Faust (1977). In order to establish when the peak rate of height growth occurs, we examined each individual males rate of height growth between the seven measurments of heighth over a five year period. We then

established when the highest rate of growth occured during the five year period.

Just as for females, we established two separate indices of pubertal development. The first is simply an indication of whether or not the male has reached his peak period of height growth prior to the interview conducted at a given grade level. This is analogous to the presence or absence of menarche for girls. In order to establish the relative onset of pubertal development for males we looked at when the peak period of height growth occured for an individual relative to others at his grade level. Once again we tried to establish a trichotomy while still maintaining the cutoff points in terms of the school year. This resulted in 44% of the males being classified as early maturers because they reached their peak period of height growth prior to the spring of seventh grade. Middle maturers on the other hand reached their peak period of height growth between the spring of seventh grade and the spring of eighth grade. Twenty eight percent of the students in our sample were classified as middle maturers. The final 28% of our sample was classified as late maturuers since they had not reached their peak period of height growth until some time after spring of eighth grade.

It is important to note that when talking about early and late development we are not talking about extremely deviant youth. Instead, for this report and presentation both males and females are categorized into subgroups sizable enough for complex statistical analysis. In future reports more extreme early and

late developers will be identified and studied. Since most previous work focuses on more extreme groups of early and late developing children this distinction should be taken into account when comparing our study with others.

Social and Psychological Aspects of Development Since the present study involves numerous measures of the subjects self-concept, behaviors, values, and attitudes, it is impossible to present detailed information on all the questions and scales that were used. In general, it should be remembered that the information is taken from personal structured interviews with the respondents in a one on one situation within the school context. This means that the measures are self reports of behaviors and perceived attitudes rather than reports from outside observers. The strength of this approach is that it deals with the subject's own feelings about how he is acting and how others are treating him. A general outline of the variety of variables used in this analysis is contained in Table 2.

Method of Analysis

In order to explore the impact of pubertal development on such a wide array of dependent variables, we used an analysis of variance framework with pubertal development as the factor. Analyses were run separately for males and females since the pubertal indicators are not identical. Separate analyses were also run for each grade level and for each of the two indicators

of physical development. Furthermore, each of these many analyses were repeated again using an analysis of covariance framework where the effects of height and weight were controlled by entering them as covariants in the model. Most of the findings to be reported here are based on the results using height and weight as covariates. In cases where the effects were quite different before the covariates were added they shall be noted.

Because of the unusally large number of analyses run for this paper we shall not present all the information on each particular analysis but rather try to summarize the findings in order to provide an overview of the results. The particularly dramatic results will be highlighted graphically to aid the reader in understanding the direction of the results.

FINDINGS

After examining the results of the analysis of variance for sixty separate dependent variables from twenty different conceptual areas over a five year time period (sixth, seventh, ninth and tenth grade), we were surprised to find that less than one fourth of the analyses were siginficant for females and only one sixth were significant for males. While those results which are significant form several interesting patterns (particularly for girls), it is nonetheless important to note that the direct influence of pubertal development as measured both in terms of presence versus absence of pubertal development and in terms of the relative onset of development was not as massive or widespread

as one might expect from current theories of adolescence. For example, for females we found puberty had no consistent effect on such areas as global self-image, her perception of how her teachers and parents evaluate her, her participation in extra-curricular activities, club leadership roles, and future aspirations. For males, we discovered that the boys perceptions of their same and opposite sex popularity, perceived self-competence in several different areas, their academic performance, dating behavior, and problem behavior were largely unaffected by their level of physical development.

Although there were fewer significant relationships with pubertal development than anticipated, it is important to note that the relationships which occured did not appear to be due to chance alone since they followed several interesting patterns. These patterns will be discussed by looking at eight different areas in which there was a significant puberty effect for either males or females at some grade level. The eight areas to be presented are global self-concept, perceived body-image, attitudes towards sex roles, opposite-sex popularity, independence, problem behavior, achievement, and participation. Results for both males and females shall be presented within each of these areas.

Global Self-Concept

In light of the wide spread changes occuring during the early and middle adolescent years it has been posited that the adolescent has the task of developing a new stable and positive

self-image. In line with this research, one might expect that those individuals who are changing physically earlier than their peers and becoming different than their peers in several ways might well demonstrate impaired self-esteem, increased self-consciousness, instability of the self-picture, and greater depressive-affect. Our results indicate that the level and timing of pubertal development for girls appears to have little or no significant effects on these variables in our study. It should be noted that our earlier research, however, has shown these very same variables to be quite responsive to changes in school environment. Self-esteem in particular was among those variables affected by a change in schools (Simmons et al., 1973, 1979; Blyth et al., 1978).

For boys, however, we did find some significant effects of puberty on their global self-concept (see Figure 1). The bars in the graphs show the adjusted deviations from the grand mean of a given variable for a specific year for a particular developmental subgroup. These adjusted deviations are obtained from an analysis of covariance and multiple classification analysis holding height and weight constant. Only statistically significant relationships are presented. If the bars in such graphs rise above the middle line, then the scores for that subgroup are as a whole significantly higher than the mean of the total sample of white males or females. Similarily, if the bars drop below the center line, that subgroup is scoring significantly below the mean. In particular, we see that the early maturing boys in seventh grade have a higher level of self-esteem than do the middle or late

developing boys. This advantage of early development is short term only since there are no differences in ninth or tenth grade. It is also interesting to note that early maturing boys perceived their parents as evaluating them more positively when they were in ninth and tenth grade. The results for the stability of the self-image are less clear. In seventh grade we find those boys who have reached or passed their peak rate of height growth have more stable self-images than those who have not. By ninth grade, however, the early maturing boys are the least stable group. This may be due to a short term increase in stability of the self-image when one perceives one is finally becoming physically an adult. Neither the males self-consciousness nor his sense of depression were significantly effected by his level of physical development.

Body-Image

While pubertal development does not seem to effect the global or overall dimensions of the self-picture for females as noted above, several more specific aspects of the self-picture were strongly influenced by puberty, particular those related to the body-image. One of the major tasks of adolescence is to incorporate the dramatic physical changes of puberty into a favorable body-image. Therefore, we asked respondents to report how satisfied they were with their height, weight, figure development (if they were a girl) and muscular development (if they were a boy). We also asked them how much they cared about each of these dimensions.

For females, early developers are generally less satisfied with their physical characteristics than are late developers even though they are more likely to care or be concerned about these characteristics. This can be seen most clearly in Figures 2 and 3. In Figure 2 we note that in seventh and ninth grade the early developing girls are less satisfied with their height than are the late developing girls. This is true even after actual height has been controlled. Similarily, we find early developers to be less satisfied with their weight at all grade levels (Figure 3). This finding, however, disappears when one introduces actual controls for the girl's weight. The fact that the significant difference between early and late developers usually disappears when actual weight is controlled indicates that it is the early developing girl's greater weight that is the primary culprit causing dissatisfaction and not early development. In any case, early developing girls tend to be more dissatisfied with their height and their weight than late developers.

In Figure 4 we find a somewhat more complex pattern for a girls satisfaction with her figure. On the one hand, in sixth grade when early developers are probably the only ones to have much of a figure, they show greater than average satisfaction with their figure. Late developers indicate less than average satisfaction. It is also worth noting that while the more developed, menstruating girls are generally more satisfied with their figure, they also show a greater range of satisfaction. By ninth and tenth grade, on the other hand, the relationship between onset of menses and satisfaction with figure development is reversed. When

all girls are developed, it is the late developers who are more satisfied (although the relatiohsip remains signficant after the covariants are controlled only in tenth grade). Thus, by ninth or tenth grade early developers are less satisfied with their height, weight and figure than are late developers. These findings generally agree with the literature. The fact that the early developers in ninth and tenth grade are shorter and stockier and the late developers are taller and slimmer helps to explain these findings. It would appear as though the late developer in ninth and tenth grade more closely approximates the American ideal of female beauty--she is tall and slim and now has a figure. The early developing girl by contrast starts out sixth grade with a figure when her peers have none but with the disadvanatge of being heavier and bigger than all of her age mates--girls and boys alike. Then in middle adolescence (grades nine and ten) she finds herself somewhat shorter and fatter than the other more recently developed girls in her class. Furthermore, as noted above, the early developing girls are not only more dissatisfied with their physical self but in general are more concerned about it. In general, early developers indicate significantly greater than average concern with height, weight and figure development than do late developing girls. This combination of being dissatisfied and concerned increases the likelihood of distress. When one rates oneself low or unsatisfactory on a specific characteristic and that the characteristic is one which that individual cares a great deal about, it is likely to cause distress (James, 1950; Rosenberg, 1967).

Although boys satisfaction with their body-image is less dramatically affected than are girls, we still find significant differences between groups. In Figure 5 we see that early maturing boys were somewhat more satsified with their muscular development in seventh and ninth grade than those who developed later. To some extent the early developing boys were also more satisfied with their height for a limited time during seventh grade. Thus, unlike the findings for girls where early developers are at a relative disadvantage in terms of body-image satisfaction we find early developing boys to be somewhat more satisfied with their bodies. By tenth grade we even note that the early developing boys perceive themselves as being more athletic than do late developing boys. Although in general there is less difference between early and late developing boys with respect to caring about physical development characteristics, we did find that late maturing boys in the ninth and tenth grade were somewhat less concerned about their physical characteristics than were the early developing boys. This may be due to the fact that the early developing boys are experiencing decreasing amounts of growth while the late developing boys are just reaching their peak rate of growth.

Attitudes Towards Sex-Roles

With the onset of puberty it is generally believed that there is an intensification of gender related role expectations which more sharply distinguishes between what is expected from males and what is expected from females. Although we did not measure sex-

role expectatons in our study, we found that girls temporarily feel less positive about being a women shortly after reaching menarche. These negative effects did not last very long and appear to be connected to the onset of menarche rather than the fact that the girl was an early or late developer. In addition, the very first group of girls to reach menarche (that is the early developers) were quite concerned about acting like a boy.

The findngs for boys are once again the opposite of what we find for girls. The early maturing boys in seventh grade feel more positive about being a boy than do the late maturing boys. Furthermore, by ninth and tenth grade the late maturing boys were more concerned about acting like a girl and reported that they were less likely to act like a girl. These findings suggest a greater level of continuity in sex roles for males than for females.

Opposite-Sex Popularity

One of the major tasks of adolescence is to learn to establish intimate relationships and to begin to relate to members of the opposite sex. In order to examine this area we asked students how popular they felt they were with members of the opposite sex as well as several questions concerning their dating behavior.

In Figure 6 we see the results for females. In sixth and seventh grade those girls who have reached menarche believe themselves to be more popular with the opposite sex and reported a

higher level of dating behavior than those girls who had not reached menarche. Similarily, the early developing girls generally perceived themselves to be more popular with boys and, at least in tenth grade, reported doing more actual dating. In addition, we discovered that early maturing girls in the sixth grade expressed more concern about being popular with boys than did late developing girls. Thus it would appear as though the development of a figure and the attainment of menarche early have a significant effect on girls perceptions of how popular they are with the opposite sex and on actual experiences with the opposite sex.

In sharp contrast to the findings for girls, we find absolutely no differences between boys who have reached their growth peak and those who have not or between the early and late developers along any of the opposite sex popularity dimensions noted above. This is the first area in which early physical development appears to be an advantage for girls.

Independence

Another central task of adolescence is to develop a greater level of independence from parents. In Figure 7 there is evidence that on a wide variety of measures in sixth and seventh grade the girls who have begun menstruating reported significantly more independence than do girls who have not yet begun to menstruate. In particular, the girls who have attained menarche are significantly more likely to be able to take the bus home alone

(in sixth grade), more likely to be left alone when parents are not home in seventh grade, more likely to babysit in sixth and seventh grade, more likely in sixth grade to perceive that they make their own decisions, and more likely to care about independence from their parents (in sixth grade). Similarly, significant findings also appear for early developing girls to indicate that they are more likely than late developers to take the bus home alone in sixth grade, to be left alone at home more often in seventh grade and to care more about independence from parents in grade six. The interesting thing to note about these effects of pubertal development on independence is that almost all disappear by ninth and tenth grade. Thus, in sixth and seventh grade those girls who have obtained menarche are also allowed to act older--that is to be more independent. By tenth grade, when early developers no long look older than their peers (since almost all girls have obtained menarche), pubertal development history no longer affects the level of independence allowed.

The findings for boys are less dramatic and consistent. In general, the early developing seventh grade boys reported only slightly more independent behavior on only a few of the variables noted above. Once again, however, there were no significant differences in independence during middle adolescence (ninth and tenth grade).

Academic Behavior

Another area in which we explored the consequences of different

levels of pubertal development is that of academic behavior as measured by grade point averages and standardized tests. The results for females are shown in Figure 8. Only grades six and seven are presented since there were no signficant findings in later years. The figure indicates that in sixth and seventh grade early developing girls are significantly less likely to show academic or intellectual success than their late developing peers. That is, early developing girls have significantly lower GPA's and score lower in reading and math achievement tests. Furthermore, early developers are less likely to rate themselves as good at school work or to aspire to college. These differences would clearly be considered disadvantages for the early developing girl during sixth and seventh grade. Whether or not these differences persist is hard to determine with our data given the tendency for early developing girls to drop out of our sample. This was particularly true for early developing girls who had low GPA's and exhibited problem behavior. Thus while it appears to be a short term effect related only to early adolescence, it may be a longer term effect than we were able to capture.

In examining the same aspects of academic behavior for males we found no significant differences either in terms of relative onset of height growth or terms of those who had experienced the peak of height height growth versus those who had not. This may in part be due to the continued emphasis on achievement among males as consistent with their sex roles. The findings for girls could be interpreted as an indication of a change in sex role expectations.

Problem Behavior at School

Another area which we examined for differences between pre-pubertal and pubertal youth is that of problem behavior as exhibited at school. Here again we found that not only were girls who had begun menstruating in sixth and seventh grade less successful academically but they were also more likely to report problem behavior at school. That is, they were more likely than the average student to have been put on probation or suspension and to score high on a general problem behavior scale which we developed. In seventh grade these girls were also likely to report skipping school. It is possible that the girls who are more developed than their peers are distracted from their school work and are more likely to be tempted into deviant behavior because of their more frequent interaction with boys. An alternative hypothesis is that they find puberty stressful and this stress is reflected in their academic behavior and problem behavior. Or finally, it is conceivable that non-pubertal or non-menstruating girls are compensating for their lack of popularity with the opposite sex by investing themselves differentially into their school work.

Once again we found no significant differences in problem behavior for different levels of pubertal development among our male sample.

Participation in Activities

A final area in which we found differences between pubertal and non-pubertal students has to do with participation and leadership in activities either within school or outside of school. For this area we looked at the number of in school extra-curricular activites students participated in, the number of out of school activities, and the number of leadership roles in either of these types of activities which students reported. For females we found no signficant differences in the number of activities they participated in or the number of leadership roles they occupied as a function of their level of pubertal development.

In contrast to this, we found that early maturing boys participated in fewer school activities and were less often leaders during such activities during sixth grade. The trend was reversed however by tenth grade when such early maturing boys participated in more activities. This change in direction could be related to the types of activities in which sixth graders versus tenth graders participate. In the earlier grade levels participation typically involved tutoring, assisting in the office, or being on the safety patrol. In later grades the activities in school were frequently more athletically oriented. It was also interesting to note that in seventh grade the later maturing boys where somewhat more likely to participate in activities outside of school. This may be related to late developers choice of a nonschool context in which to become involved. Oddly enough, those boys who had reached their peak of height growth prior to the seventh grade interview were less likely to be leaders than those who had not yet reached their peak

period of height growth. The differences were small but statistically significant in seventh grade. This is one of the few areas in which we found any negative effects for the early developing male.

DISCUSSION

At the beginning of this report we asked three questions having to do with the direction of the pubertal effect, the short versus long term nature of any effects, and whether the more mature an individual is physically leads to more mature treatment of him or her by others. Before dealing with these specific questions, however, it is important to address a more general one: how substantial is the effect of pubertal development upon the adolescent male and female? Our findings indicate that the effects of pubertal development are specific rather than global and extensive. Despite theories of adolescent storm and stress which imply pubertal changes will negatively affect the self-image, over all adjustment and relations with parents, we show little or no consistent impact in these areas for girls and some positive changes in certain of these areas for boys. For the girls in our study pubertal development had no consistent effect on global selfesteem, overall levels of depression, degree of self-consciousness, perceived evaluation of parents, or on other indicators of affective parental relationships. In addition, the stability of the girls self-picture was unaffected as was their perceived competence in such areas as school work, athletic ability, and their participation in activities and the fulfillment of leadership roles. A girls level of pubertal development did

have a significant effect in several very specific areas. These areas were the girl's body-image, relationships with members of the opposite sex, levels of independence, academic performance, and the extent of problem behavior in school. It is worth noting that these specific variable clusters are all related to what have been identified as key developmental tasks or problems of adolescence: The need to incorporate physical changes into a new and favorable body-image, the need to establish new relationships with the opposite sex, the task of developing independence from parents, and the problem of obedience to or rebeling against adult regulations, particularly in school (see Havighurst, 1953; Aldous, 1978).

For the boys in our study there were even fewer signficant effects of pubertal development. Although certain aspects of a boys global self-image were effected by physical development, early developing boys were neither more self-conscious nor more likely to express a sense of depression than were later developing boys. Unlike girls, there was no relationship between popularity with the opposite sex and levels of physical development. Although the boys body-image was significantly affected in certain key ways by their level of physical development, the effects were less dramatic and pervasive than those found for girls. Boys of different levels of physical development did not perceive themselves to be more compentent in areas such as school work and general intelligence although they did see themselves as having differential athletic ability in tenth grade. In contrast to girls, there was no relationship between levels of pubertal

development and academic performance or most forms of problem behavior. There was also less of a relationship between a boy's level of physical development and his independence from his parents.

With this general understanding of what overall areas were affected or unaffected by different levels of pubertal development for both males and females we are ready to move on to our three more specific questions.

Is Pubertal Development Advantageous or Disadvantageous?

In this section we shall address the issue of whether or not pubertal change and in partciular, early pubertal change, is an advantage or disavantage for the adolescents in our study. Prior literature suggested that, in general, early development was a disadvantage for girls, at least initally. Our results indicate that the effects of early development depends on the particular dimensions at issue; the findings are mixed. On the one hand, early development appears to be a disadvantage for the girls' body-image, school performance, school behavior, and to a lesser extent their attitudes towards being a girl. On the other hand, early development appears to be an advantage in terms of popularity with the opposite sex and independence.

The disadvantages are particulary salient when we look at the girl's body-image. The early developing girl is generally more dissatisfied with her height and weight, and by ninth and tenth

grade she is also more dissatisfied with her figure. At the same time she cares more than her late-developing peer about these very same characteristics. Prior research indicates that caring a great deal about an area in which one evaluates oneself unfavorably can be particularly distressing (James, 1950; Rosenberg, 1957). Thus, it is likely that the early-developing girl experiences some distress because of her attitude towards her own appearance. This dissatisfaction of the early developing girls with their body-image is probably due in great part to the fact that a higher porportion of them end up shorter and heavier than their late developing peers.

We also have found that in sixth and seventh grade early developing girls are at a disadvantage academically. They are less likely to earn good grades and or to score well on standardized achievement tests. They are also more likely to be behavior problems at school. We suggested that the early maturers greater involvement with boys may distract them from their school work and tempt them to deviate from school rules. Evidence has been presented in earlier publications from this study (Simmons et al., 1979) that girls that date early are more likely to be the ones to score low in achievement tests, to have low GPA's, and to rate themselves as having more school behavior problems. However, an alternative hypothesis is that the late maturers compensate for their lack of popularity with the opposite sex by spending more energy on their school work. It is possible that both hypothses are operating.

The final disadvantage we noted for girls was that there was a slight tendency for girls to feel less positively about being a girl immediately after they reached menarche. This effect was short term and not particularly large though statistically significant.

Despite the above disadvantages of early development, the girl who matures more rapidly also experiences some advantages. She is more likely to perceive herself as popular with the opposite sex and, at least initially, she is likely to be allowed greater independence from her parents. It is unclear, however, whether the fact that she dates earlier is an advantage or a disadvantage. In a prior analysis Simmons et al. (1979) indicated that dating in early adolescence has a negative impact on a girl's level of self-esteem. Many early adolescent girls do not appear emotionally ready for this type of behavior. Findings from Douvan and Adelson (1966) also support this conclusion.

For boys, the literature has generally shown that early development is advantageous. Although there are a number of areas as noted above which were not effected by levels of pubertal development, those areas which were affected can generally be perceived of as giving the advantage to the early developing boy. Early developing boys had higher levels of self-esteem and more stable self-images, were generally somewhat more satisfied with their muscle development and their height, saw themselves as more athletic, felt more positively about being a boy at certain points in time, and reported at least some more independent types of

behavior although the differences were slight. The only area in which early maturing boys did not have a clear advantage was in participation of activities. Here we discovered that in the early adolescent years it was frequently the late maturing boys who participated more frequently in school activities and was more often selected at a leader. This finding did reverse however in tenth grade such that early maturing boys at that grade level had the advantage of participating in more activities. Since our classification on participation is rather general, it is possible that a more specific categorization of activities in terms of atheltic and academic or social activities could help separate out where early and late developing boys have the upper hand. As noted above, we suspect that the early maturing boys participate more in activities in tenth grade because of the higher porportion of athletic activities in the upper grades. Further work will need to be done to clarify these relationships,

In summary, we found that in our sample the early developing girls experienced a mixed blessing throughout most of the early and middle adolescent time period. In some areas they were at an advantage relative to their late developing peers and in other areas they were at a disadvantage. For early developing boys, however, we found primarily advantages. During the early and middle adolescent time period, the late developing boy is at a comparative disadvantage in several areas. Readers are once again reminded, however, that there were a large number of areas where there were no differences between early and late developing boys or early and late developing girls.

How Long Lasting Are the Effects of Pubertal Development?

A second question to be addressed in this analysis involved the extent which the impact of different levels of pubertal development could be said to have long term or short term consequences. That is, does the impact of pubertal development occur at the time of the change only or are there lasting effects of being an early, middle, or late developer? Previous analyses of the California longitudinal studies (Jones, 1965; Peskin, 1973) suggests that there are both immediate and long-term effects of early and late development. Although our study is confined to the early and middle adolescent years, our data show many more consistent, significant effects of pubertal development at the time of development than appear a year or two later when most of the students have reached puberty. For girls the effect of pubertal development is more prominent and pervassive in sixth and seventh grade than it was in ninth and tenth grade. For example, differences between early developers and later developers in indpendence are present almost exclusively in grades six and seven. It is only in these years that the early developers actually look more like adults than do the other girls. Differences in academic and school problems also seem to occur only in early adolescence. The fact that there is differential drop-out from the sample, however, make these last findings difficult to interpret. Had the early developers who are doing less well in school or showing problem behaviors stayed in the sample, we might have continued to find greater deviance and less academic success among early developers in ninth and tenth grade.

This might have made us less likely to conclude that many of the effects of pubertal development are short lived.

While for some variables, the impact of pubertal development may be short lived, there are certain effects for girls that do continue into middle adolescence. An unfavorable body-image among early developing girls persists into ninth and tenth grade in reflection of actual physical differences that also persist (primarily greater heaviness). In one area, the affects of pubertal development lasts even after the physical cues that triggered them have disappeared. Earlier-developing girls perceive themselves to be more popular with boys and/or to date more not only in sixth and seventh grade but also in ninth and tenth grade. Presumably the early figure development attracted boys in sixth and seventh grade, but by ninth and tenth grade almost all girls have a figure. The early dating may have provided the early developing girls skills which help her maintain her popularity. Also, her early view of herself as attractive to boys itself may help to perpetuate this attraction.

As discussed in the introduction, it has been proposed by some that early development would make adjustment to adolescence more difficult due to the premature termination of the latency period. There is, in fact, some evidence that adjustment at the time of menarche for girls may be more difficult for early developers than for later developers. Early developers demonstrate a greater than average number of problems in school at the time of their menarche (grades sixth and seventh); while late developers do not exhibit a

higher level of school problems when they reach menarche (e.g., grade nine). If however, we look at the time of middle adolescence for all girls (grades nine and ten) in order to determine which group is experiencing more difficulty, there is no clear answer. The lack of information in eighth grade becomes a particular drawback in these comparisons.

How long lasting the effects of pubertal development are for boys is more difficult to determine. Because the boys' physical development begins later than for girls and because we are missing information from the eighth grade time period, we really do not have a long enough time frame to judge whether or not the effects for puberty for males will last after individuals have finished maturing. Nonetheless, it is the case that there are virtually no differences between early and late maturers in sixth grade when students are all prepubertal, and that most of the differences we do find occur in seventh and ninth grade. This is true for the higher level of self-esteem among early maturing boys in seventh grade, the greater satisfaction with their muscle development, their positive attitude about being a boy in seventh grade, and the somewhat greater independence they are permitted in seventh grade. In addition to these findings, however, there are also areas in which the ninth and tenth grade early developers are doing better than their late developing peers. In ninth and tenth grade our early maturing boys perceived their parents as evaluating them more positively, saw themselves as more athletic, and were more likely to participate in actitivies at school than were their later developing peers. These effects could be either

long term effects of the differential onset of pubertal development or they could be the effects of a different aspect of physical development (e.g., attainment of adult height) than the peak in height growth which we used as our indicator. Alternatively, it is possible that these advantages only occur after a certain amount of time has elasped after the period of peak growth. In order to answer these questions further analysis would need to be done.

In summary, it would appear as though the effects of early pubertal development are generally short lived for girls except with respect to their dissatisfaction with their body-image and their greater popularity with the opposite-sex. For boys, on the other hand, it is difficult to draw any firm conclusions because of the limited time period which has elasped after their development has occurred. The findings which we do have suggest that the advantages which accrue to early developing boys tend to occur at different points in time: some occuring in seventh grade and others not until tenth grade. A longer period of followup would be necessary to answer this question more fully for males.

Are Early Developing Individuals More Adult-like?

Aside from the issue of whether early development is an advantage or disadvantage and how long lasting its effects are, there is another question which is also relevant. Do individuals who reach puberty early in adolescence and therefore resemble adults more also approximate adult attitudes and behaviors more? As we

have noted above, there are several ways in which girls who look older also act older. Girls who have obtained menarche are more likely to date in grades six and seven. They are also more likely to be allowed independence from their parents. In addition, in sixth grade only, girls who have obtained puberty are more likely than their counterparts to report that teachers expect occupational planning of them. These findings suggest that the early developing girl who looks more like an adult than her undeveloped peers is more adult-like.

For boys, however, there is very little evidence that the early developing male is granted a higher, more adult-like status than is his late maturing counterpart. Only in the area of independence do we see the early developing males being treated more like an adult. It is possible that the higher perceived evaluation of parents which early maturers receive in ninth and tenth grade is also related to a sense that these individuals are more responsible and mature. There is, however, no way to confirm or refute this inference. The lack of evidence in this area for boys is rather surprising in light of the common stereotypes which exist in the media and the generally positive effects of puberty for males.

SUMMARY

Using data from a five year longitudinal study of over 460 white males and females this artilce examines the impact of pubertal development on both males and females accross a broad

spectrum of self-concept, behavioral, value, and attitudinal dimensions. Pubertal development was measured both in terms of the presence of maturity and the relative onset of maturity in comparison with ones peers. The measure of pubertal development for girls was the date of menarche. For a boy, the time period in which he experienced his highest rate of height growth was used as a late indicator of maturation. The analysis examined the effects of these maturation variables on an entire set of social psychological development variables in grade six, seven, nine, and ten.

The results indicate that for a substantial number of the dimensions investigated pubertal development had no effect. There were fewer effects for males than for females and the patterns for females were generally clearer. Early physical development for females was a mixed blessing in that the early developing girls experienced advantages in terms of opposite sex popularity and greater independence but disadvantages in terms of dissatisfaction with their body-image, lower academic success, and more problem behavior. For males the results indicated that early pubertal development is more of an advantage than late pubertal development. The early developing males had higher levels of self- esteem, more stable self-images, more positive attitudes towards being a male, were evaluated more positively by their parents, and to some extent had more independence. Most of the effects for both males and females were relatively short term in that they were present only for a year or two. These results are generally consistant with what previous studies have found.

Although the present analysis controlled for actual differences in height and weight, there are a number of socio-cultural variables which have not yet been controlled. To the extent that one takes a position of cultural relativism with respect to how physical development is experienced by an individual, it may be quite important to know more about the setting within which the student's physical development takes place. Although previous anthropological work has shown the cultural context within which puberty occurs to be quite important (see Sommer, 1978 for a review), almost no work has been done on the effect of different subcultures within the United States and how these might alter the effect of pubertal development. Related to this issue, is the question of whether or not different school contexts during the critical years of early and middle adolescence can have an effect on the social and psychological development of students at different levels of maturity. It is to these issues which our future analyses will turn. It is possible that the general lack of effects noted in the present paper will be replaced by differential effects in different school contexts.

TABLE 1

FIVE YEAR LONGITUDINAL STUDY (1974 to 1979)

-18 Randomly Sampled Schools containing either kindergarten through eighth grade students or kindergarten through sixth grade students.

-All sixth graders in each school were asked to participate (82% did).

-Only students remaining in the school district were followed into seventh, eighth, ninth and tenth grade.

-Number of Cases with Useable Puberty Measures (69% of the males and 83% of the females in the original white sample).

	White Boys	White Girls
6th Grade	231	237
7th Grade	231	225
9th Grade	169	169
10th Grade	178	151

TABLE 2

Major Dimensions and Subareas of
Social Psychological Development Which Were Examined

Self-Concept

- Global Self-Image
- Perceptions that Adults Evaluate One Highly
- Perceived Social Image Among Same and Opposite Sex Peers
- Perceived Body-Image
- Perceived Self-Competence
- Perceptions of Sex Role

Behavior

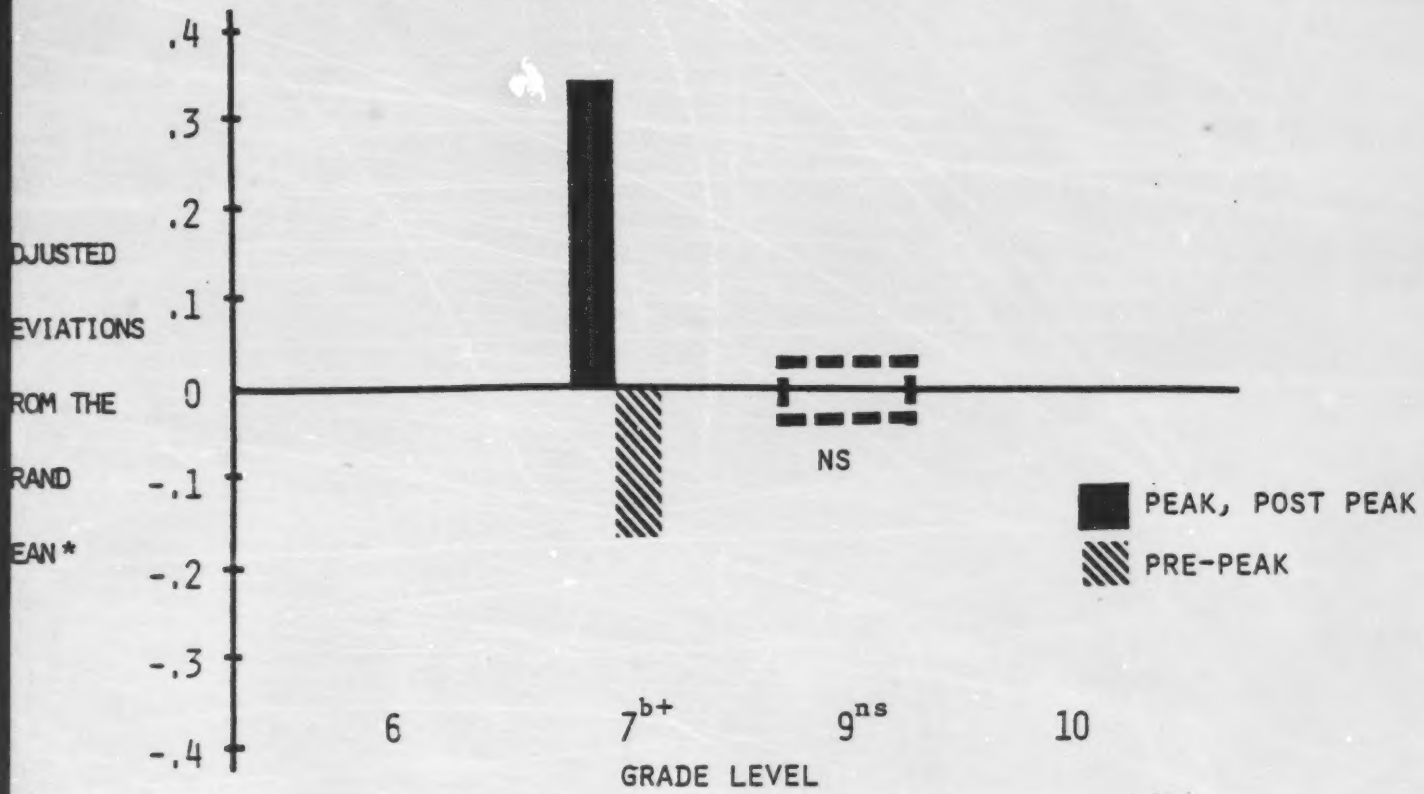
- Participation in Activities
- Academic Performance
- Dating Behavior
- Victimization
- Problem Behavior
- Independence from Parents

Values, Attitudes, and Related Perceptions

- Concern with Body-Image
- Concern with Popularity
- Concern about Competence and Independence
- Perception that Others Expect One to Act Older
- Perception of Others' Expectations About Opposite-Sex Relationships
- Perception that Others Expect One to Make Career Plans
- Educational, Marital, and Occupational Aspirations
- Perception of Parent-Peer Relationships

FIGURE I PUBERTAL DEVELOPMENT AND SELF ESTEEM FOR MALES

EFFECTS OF ATTAINING PEAK RATE OF HEIGHT GROWTH



EFFECTS OF EARLY/MIDDLE/LATE DEVELOPMENT

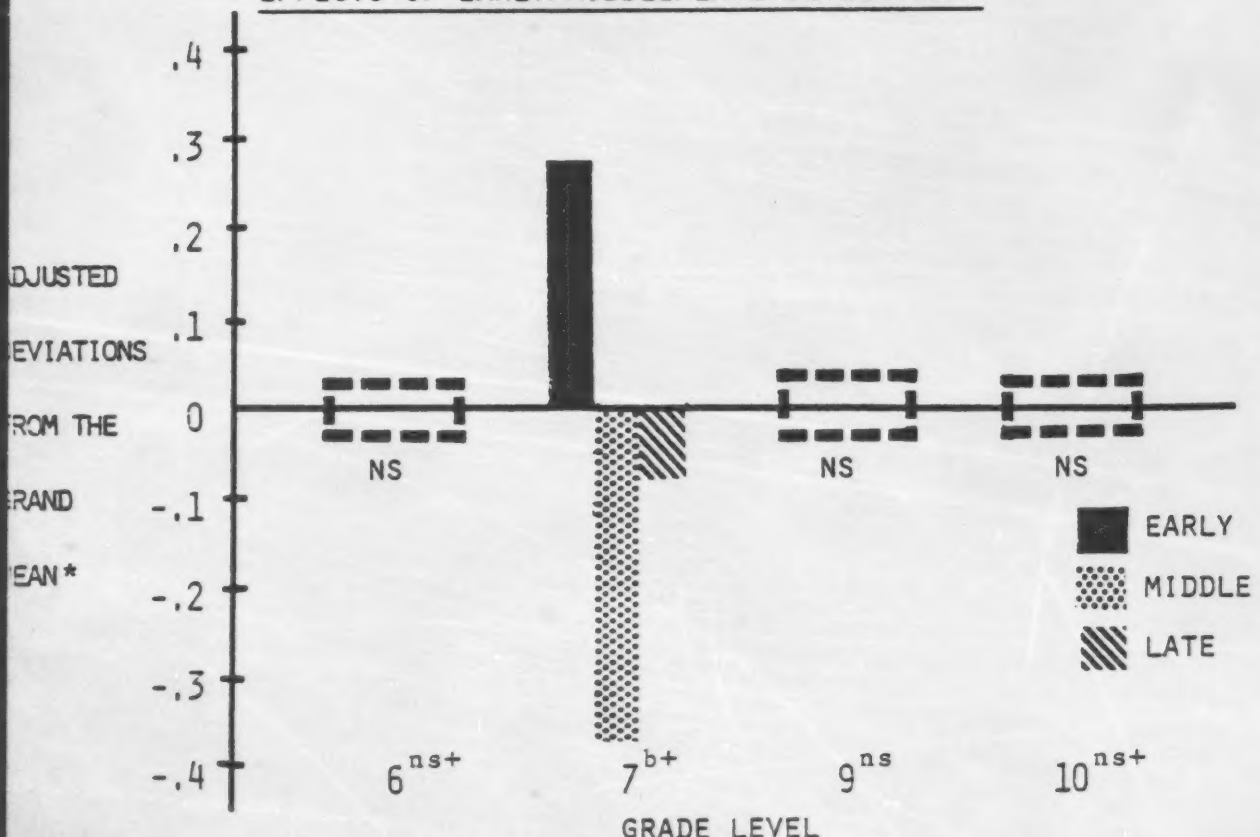
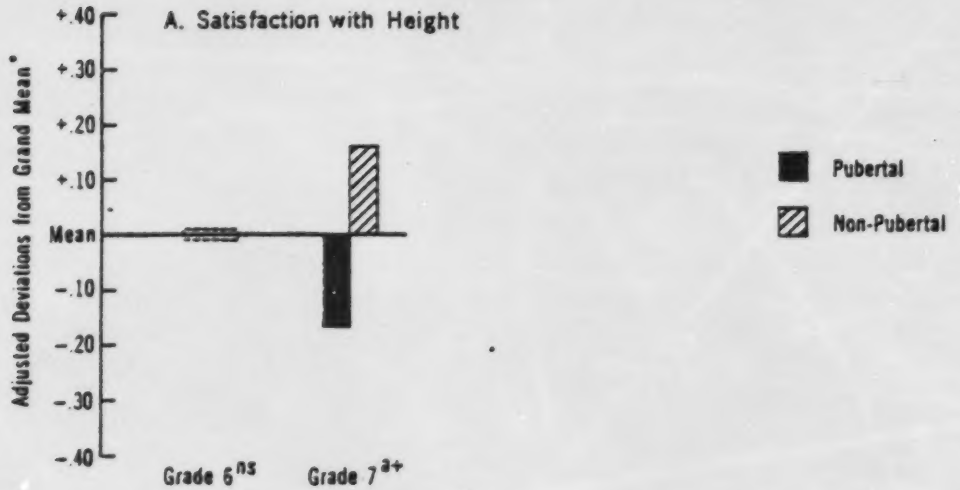


Figure 1
Pubertal Development and Satisfaction with Height

Effects of Presence/Absence of Menstruation



Effects of Early, Middle, and Late Development

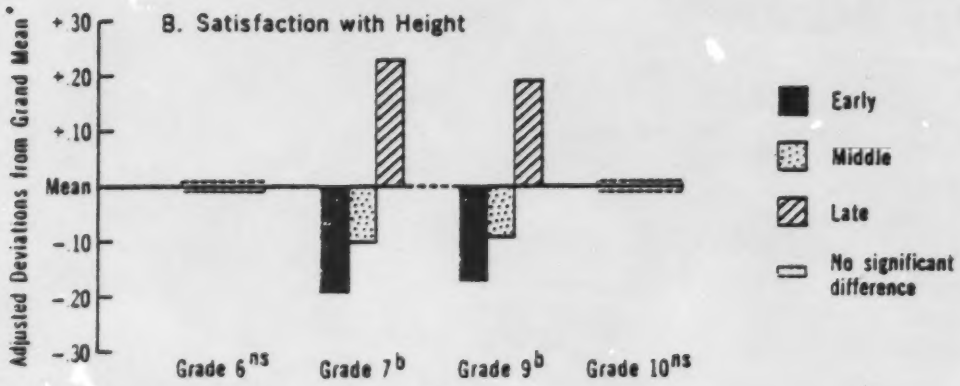
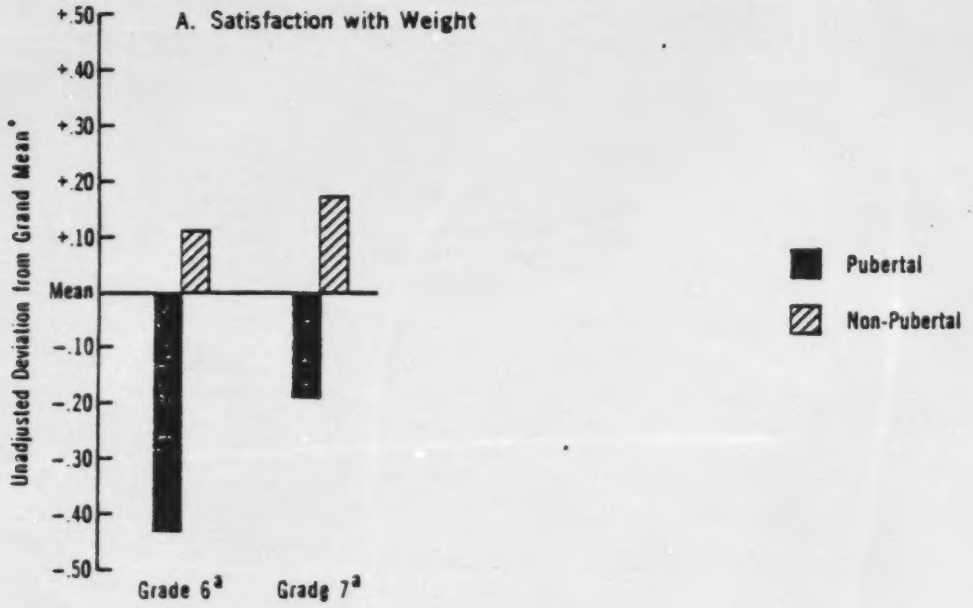


Figure 2

Pubertal Development and Satisfaction with Weight

(unadjusted deviations)

Effects of Presence/Absence of Menstruation



Effects of Early, Middle, and Late Development

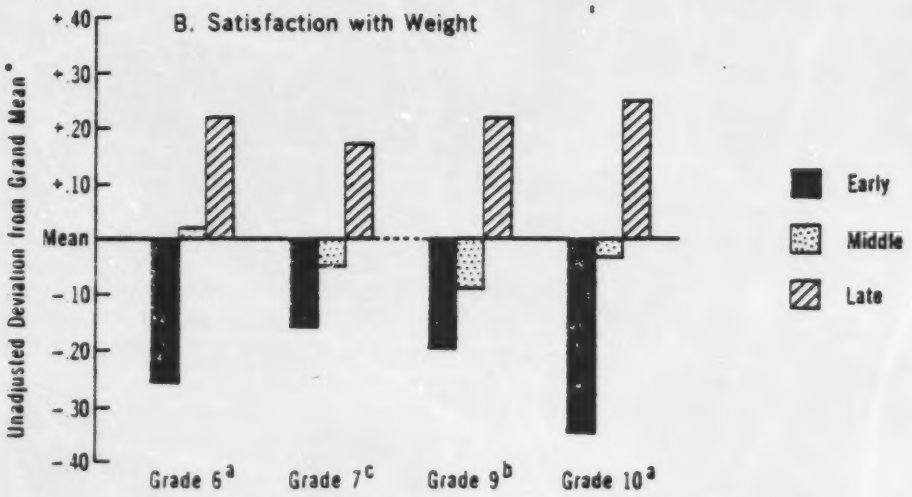
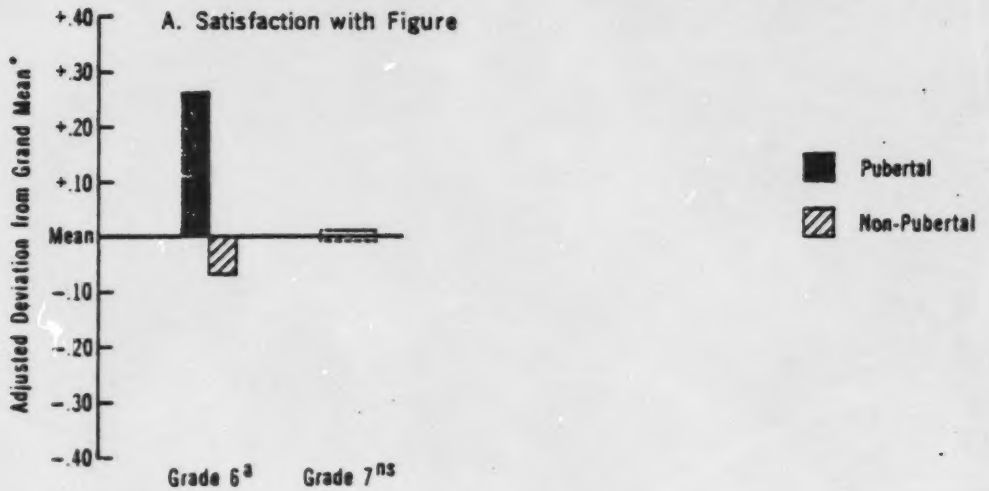


Figure 4

Pubertal Development and Satisfaction with Figure

Effects of Presence/Absence of Menstruation



Effects of Early, Middle, and Late Development

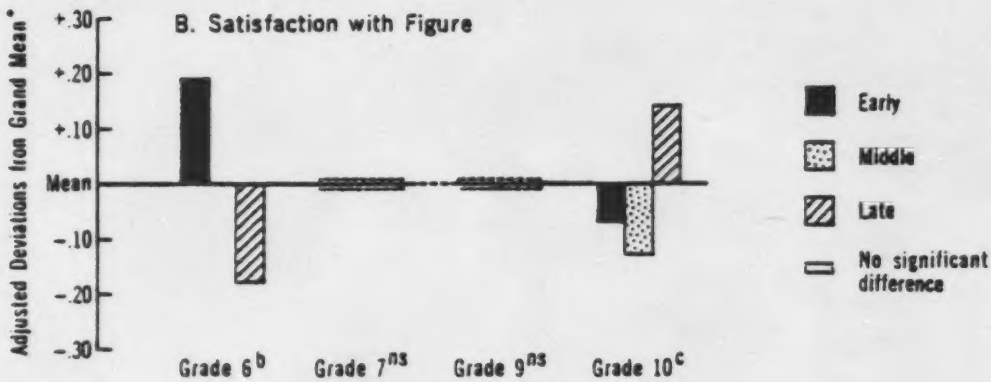


FIGURE 5 PUBERTAL DEVELOPMENT AND SATISFACTION WITH MUSCLE DEVELOPMENT

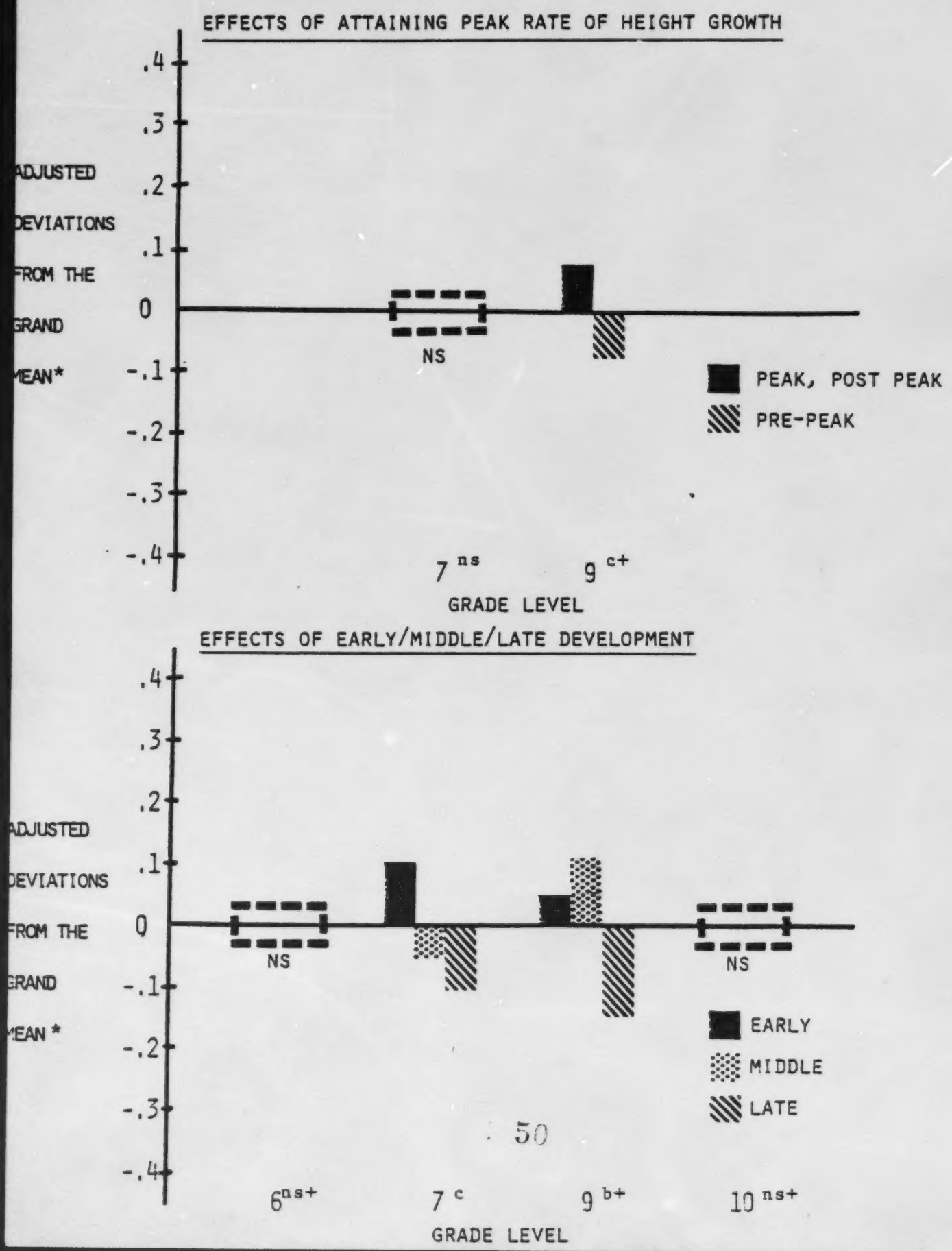
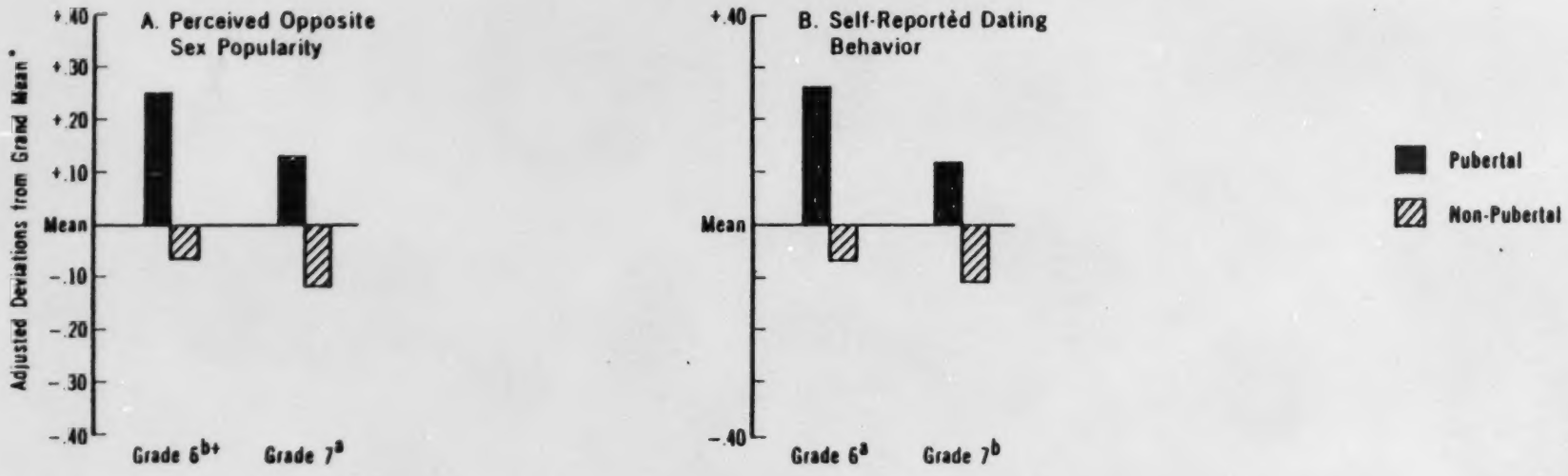


Figure 6

Pubertal Development and Opposite Sex Relationships

Effects of Presence/Absence of Menstruation



Effects of Early, Middle, and Late Development

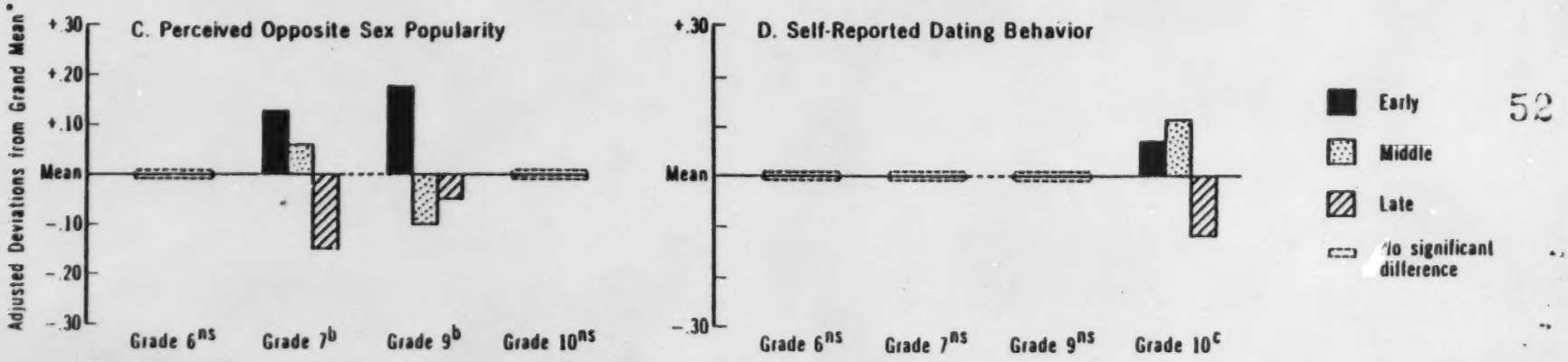
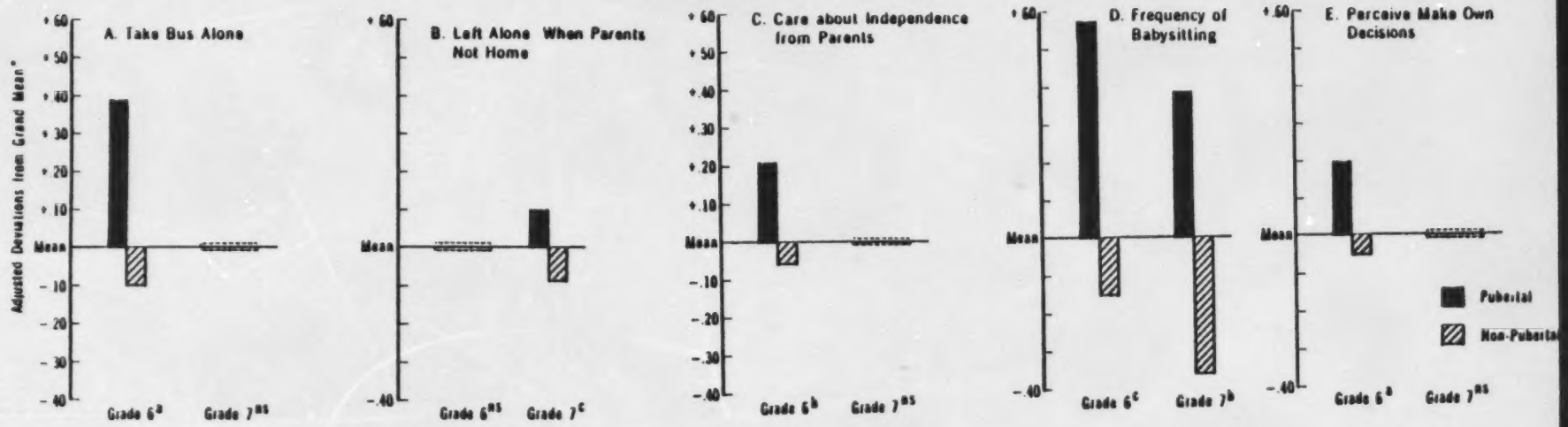


Figure 7

Pubertal Development and Independence from Parents - 6th and 7th Graders Only

Effects of Presence/Absence of Menstruation



Effects of Early, Middle, and Late Development

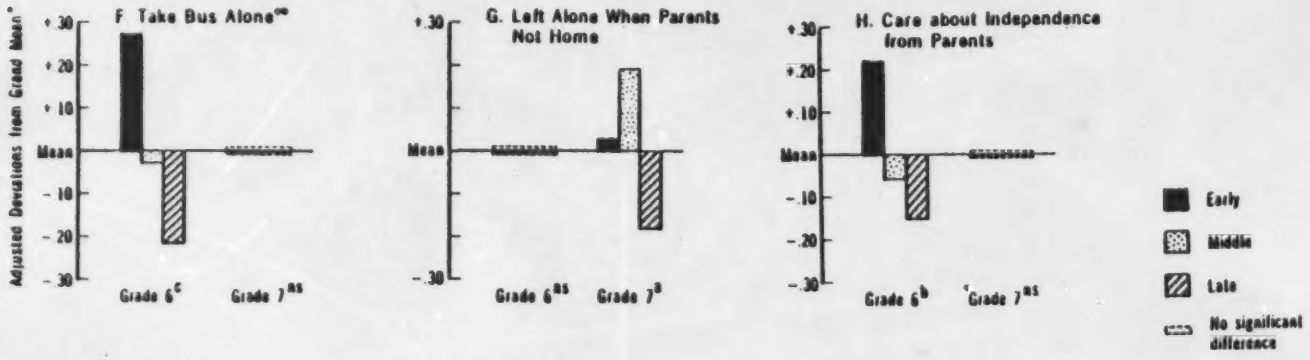
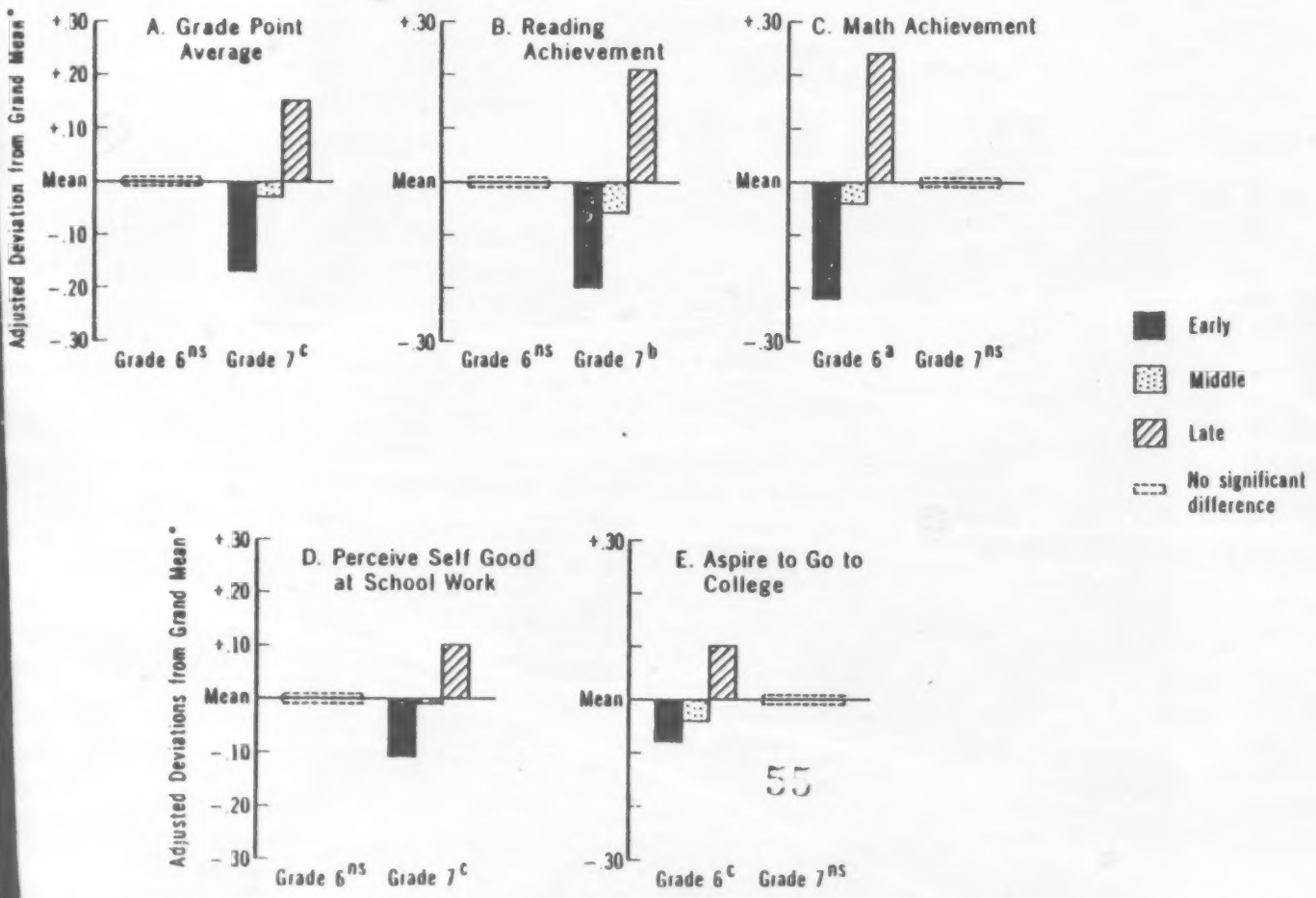


Figure 8

Pubertal Development and Achievement - 6th and 7th Graders Only

Effects of Early, Middle, and Late Development



FOOTNOTE TO ALL FIGURES:

* A separate grand mean is used for each year and each variable.

Significance of relationship between puberty and variable:

$^{a}p \leq .01$

$^{b}p \leq .05$

$^{c}p \leq .10$

^{ns}Not Significant

+ Independent variable-covariate interaction significant, $p \leq .05$

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